

A COMMUNICATIONS SYSTEMBACKGROUND OF THE INVENTION

Inventor

The present invention relates to a communications system and in particular, but not exclusively, to one having two domains or segments.

Description of the Related Art

Known office based communication systems usually operate with fixed line telephone units within the office linked via an internal switch board or PBX (private branch exchange). Such fixed line systems are able to provide relatively high voice quality although users are not able to move for the duration of a call.

The advent of wireless cellular telecommunication technologies, an example of which is the GSM standard (Global System for Mobile communications) means that wireless systems can provide at least the equivalent voice quality as compared to fixed line systems. Wireless cellular systems also have the advantage that the user can move.

WIO "wireless intranet office" is a proprietary communication system which is being developed by the present applicants. This WIO system introduces the concept of utilizing mobile terminals, such as conventional GSM mobile stations, in an office environment. The system makes use of a known concept called internet telephony or voice-over-IP. (IP stands for internet protocol.)

Voice-over-IP allows audio, video and data information to be transmitted over the existing IP-based local or wide area networks or the Internet. The technology thus provides for convergence and integration of the communication of three different data types over the same network.

Prior to the introduction of voice-over-IP, offices often operated three separate networks for the transmission of audio, video and data information. Fixed line telephone systems coupled

5 to an in-house PBX provided voice communication. An office based
local area network (LAN) or intranet (i.e. a packet switched
internal network) having computer terminals linked via network
cards and under the control of a server station provided for the
transmission of "conventional" computer data. Video cameras
10 linked to monitors via a fixed line or wireless link provided for
video communications. With voice-over-IP, audio, video and data
information can be transmitted simultaneously using the same
packet-switched network or IP-router throughout the office
environment and beyond the confines of the office.

15 In order to provide for such media convergence, voice-over-IP
often uses a specific ITU (International Telecommunication Union)
standard protocol to control the information flow over the
intranet. One common standard protocol used in voice-over-IP
systems, and the one used in the WIO system is termed H.323.
20 H.323 is an ITU standard for multimedia communications (for
example voice, video and data) and allows multimedia streaming
over conventional packet-switched networks. The protocol provides
for call control, multi media management and bandwidth management
for both point-to-point (two end users in communication) and
25 multipoint (three or more end users in communication)
conferences.

30 The H.323 protocol is network, platform and application
independent allowing any H.323 compliant terminal to operate in
conjunction with any other H.323 terminal.

35 The H.323 standard defines the use of three further command and
control protocols. H.245 is for call control and is responsible
for control messages governing the operation of the H.323
terminal including capability exchanges, commands and
indications. Q.931 is for call signalling and is used to set up
a connection between two terminals. The RAS (Registrations,
Admissions and Status) signalling function governs registration,
40 admission and bandwidth functions between endpoints and
gatekeepers. Gatekeepers will be discussed in more detail

5 hereinafter.

For a H.323 based communication system, the standard defines four major components: terminals; gateways; gatekeepers; and multipoint control units (MCU).

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Terminals are the user end-points on the network and can be a fixed telephone, a fax unit or a computer terminal. All H.323 compliant terminals must support voice communications and optionally video and data communications.

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Gateways connect H.323 networks to other networks or protocols. For an entirely internal communications network, i.e. one with no external call facility, gateways are not required.

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Gatekeepers are the control centers of the voice-over-IP network. It is under the control of a gatekeeper that most transactions (communication between two terminals) are established. The primary functions of the gatekeeper are bandwidth management call control controlling the number of simultaneous H.323 connections and controlling the amount of bandwidth these calls consume. An H.323 "zone" is defined as a collection of all terminals, gateways and multipoint-control units (MCU) which are managed by a single gatekeeper. Multipoint control units (MCU) support communications between three or more terminals. The MCU comprises a multipoint controller (MC) which performs H.245 negotiations between all terminals to determine common audio and video processing capabilities, and a multipoint processor (MP) which routes audio, video and data streams between terminals.

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The conventional voice-over-IP system described hereinbefore normally utilizes standard fixed-line telephone systems which are subject to the disadvantages of a lack of mobility.

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The WIO concept takes voice-over-IP further in that it provides for the use of conventional mobile terminals, such as GSM mobile stations, within the voice-over-IP system. To provide for such

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5 mobile communications within an intra-office communication
network, the WIO system combines known voice-over-IP with the use
of conventional wireless terminals within the voice-over-IP
system. Those telephone units may be GSM mobile stations. This
10 WIO concept may be in the context of a intra-office communication
network.

Thus, in the WIO system intra-office calls to mobile stations are
routed through the office intranet and external office calls are
routed conventionally through the GSM network. Such a system
15 provides most or all of the features supported by the mobile
station and the GSM network such as telephone directories, short
messaging, multiparty services, data calls, call barring, call
forwarding etc. WIO thus provides for integrated voice, video and
data communications by interfacing an H.323 based voice-over-IP
20 network with a GSM mobile network.

The WIO system is a cellular network similar to the conventional
GSM network and is divided into H.323 zones as discussed
hereinbefore. One H.323 zone may comprise a number of a GSM cell.
25 Two or more H.323 zones may be contained with an administrative
domain.

Security problems can arise between the office and operator
domains of the network. The operator domains of the network are
30 those which are administered by an operator and will typically
include the mobile communication supporting components. The
office domain typically includes the office intranet and is
maintained by the corporation.

35 It has been recognised by the inventors that H.323 traffic would
be rejected by network protection measures, thus preventing cross
domain calls to take place.

A second problem with the proposed WIO system arises when there
40 is a call between a fixed H.323 terminal and a mobile station.
Currently, if a mobile station moves from being supported by one

5 network element to being supported by another network element,
difficulties can arise. In particular, the fixed terminal would
need to break its connection with the network element which
previously supported the mobile station and establish a new
10 connection with the network element which now supports the mobile
station. This is a cumbersome process and data can be lost
unnecessarily.

SUMMARY OF THE INVENTION

a Accordingly, it is an aim of embodiments of the present invention
to address these problems.

15 According to one aspect of the present invention, there is
provided a communications system comprising a first part and a
second part, the first and second parts being connected so that
a first user in one of the first and second parts can communicate
20 with a second user in the other of the first and second parts,
wherein at least said first user is able to move within the
respective part of said system, said system further comprising
a gateway for permitting communications between said first and
second parts, said gateway comprising a register for storing
25 information associating the said first and second users and for
storing information relating to the current location of the first
user so that information from the second user can be directed to
first user.

30 The gateway thus stores information relating to the current
location of the first user. Accordingly, even if the first user
is moving, the connection between the second user and the first
user can be fixed for the duration of a call and handoff of the
first user does not need to be considered by the second user. In
35 preferred embodiments of the present invention, the second user
is stationary.

When the location of the first user changes, preferably
information relating to the new location is stored in the
40 register of the gateway. Thus, information from the second user
can be directed by the gateway to the new location of the first

5 user and vice versa.

The first user may be a mobile terminal which is in communication with a base station. The base station may be coupled to a respective network element and the identity of the network
10 element may be stored in the register as the current location information of the first user. The functions of the base station and the network element may be provided by a single element. In other words, the gateway may direct information from the second user to the network element associated with the first user. The
15 network element may then forward the information from the gateway element to the first user. The network element may be arranged to process the information received from the second user via the gateway so as to be in a format suitable for the first user.

Preferably, an identifier allocated in the network element which is arranged to receive communications intended for the first user is stored in the register. By identifying the port of the
20 respective network element, the first user may be effectively identified as that first user will be exclusively associated with that port.
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A gatekeeper element in said first part may be arranged to control the updating of the register and the handover of the first user between base stations and their respective network
30 elements. The gatekeeper element may be defined by the second user as the initial destination during call set-up and the gatekeeper may poll the plurality of network elements in order to determine the location of the first user. The gateway may be transparent during call set-up procedure. In other words, the
35 gateway does not alter the information from the second user as it passes to the gatekeeper. Preferably, after call set-up, information is forwarded directly from the gateway to the respective network element. In other words, information from the gateway is not directed to the respective network element via the
40 gatekeeper.

5 Preferably, the gateway is arranged to check the source and
destination of all information sent between the first and second
users in the first and second parts and to permit the information
to be passed through said gateway if the source and destination
10 information matches the information stored in the register. The
source is of course one of the second and first users and the
destination is the other of the first and second users.

The second user may operate in accordance with the H.323 protocol
whilst the first user may operate in accordance with the GSM
15 standard or any suitable cellular telecommunications standard.

Preferably, the second user includes information as to the
identity of the first user but not the location thereof in
information sent to the gateway and said gateway adds the
20 location of the first user from said register to said information
from the second user.

According to a second aspect of the present invention, there is
provided a gateway for use in a communications system comprising
a first part and a second part, the first and second parts being
25 connected so that a first user in one of the first and second
parts can communicate with a second user in the other of the
first and second parts, wherein at least said first user is able
to move within the respective part of said system, said gateway
being arranged in use between said first and second parts, said
30 gateway comprising a register for storing information on the
identity of said first and second users and for storing
information relating to the current location of the first user
so that information from the second user can be directed to first
35 user.

According to a third aspect of the present invention, there is
provided a communications system comprising a first part and a
second part, the first and second parts being connected so that
40 a first user in one of the first and second parts can communicate
with a second user in the other of the first and second parts,

5 said system further comprising a gateway element between said
first and second parts, said gateway comprising a register for
storing information on the identity of said first and second
users, wherein said gateway is arranged to check the source and
10 destination of all information sent between the first and second
users in said first and second parts and to permit the
information to be passed through said gateway if the source and
destination information matches the information stored in said
register.

BRIEF DESCRIPTION OF THE DRAWINGS

15 For a better understanding of the present invention and as to how
the same may be carried into effect, reference will now be made
by way of example only to the accompanying drawings in which:

Figure 1 shows a block diagram showing the components used in the
20 implementation of the WIO system proposed by the applicant;

Figure 2 is a block diagram showing an embodiment of the present
invention; and

Figure 3 shows in detail possible arrangements for the mobility
and media gateway and firewall arrangement of Figure 2.

25 Trans 2
In the office environment, denoted by the dashed box 100 in
Figure 1, within which the WIO system is implemented, there is
an IP (internet protocol) based LAN 10 operable to carry packet
form data.

30 One or more mobile stations (MS) 1 communicate, i.e. transmit
signals to and/or receive signals from, a base transceiver
station (BTS) 2. The base transceiver station 2 used in the WIO
system is similar to the base transceiver stations used in
35 conventional GSM cellular communication systems in that the base
station 2 is connected to, and operates in conjunction with, a
controller. In a conventional GSM system, the controller is
termed a base station controller (BSC). However, in the WIO
system, the controller is represented by a GSM radio gateway 3,
40 the function of which will be described hereinafter. The base
transceiver station 2 therefore receives signals transmitted by

5 the mobile station 1 and forwards them to the GSM radio gateway
3. The GSM radio gateway 3 is also connected to the LAN 10.

10 A WIO gatekeeper (WGK) 4 is connected to the LAN 10 as is an
H.323 terminal 5. The H.323 terminal 5 may be represented by a
computer terminal which may support voice communication.

15 Connected to the LAN is a GSM gateway 8. The GSM gateway 8 is
also connected to a standard GSM network 40 as used in a
conventional mobile communication system. The network is
sometimes referred to as a public land network. The WIO system
allows for the use of mobile telephones in the office environment
to make both internal and external office calls. The functions
of each of the components of Figure 1 will now be described in
more detail.

20 The GSM radio gateway 3 performs similar functions to that of a
base station controller in a conventional GSM network such as the
management of radio resources and channel configuration and the
handling of the base transceiver station configuration. However,
25 the GSM radio gateway 3 also provides conversion from GSM voice
data to packet based data suitable for transmitting on the packet
based LAN 10.

30 The WIO gatekeeper 4 is the main controller of the WIO system.
It is responsible for all of the functions which the H.323
protocol defines to its gatekeeper, including call management,
call signalling. It is also responsible for mobility management.
The WIO gatekeeper 4 is able to manage the main different call
types such as voice, data, facsimile and conference calls which
35 can be established between a mobile station, a PC terminal and
a normal telephone in any combination.

40 The GSM gateway 8 handles communication between the WIO
environment and the mobile services switching center (MSC) of the
GSM network. From the MSC viewpoint, the WIO appears to be a
conventional base station subsystem. The A-intranet gateway 8

5 also provides isolation means for disconnecting the WIO system from the MSC in the event of WIO system failure.

10 The telephone calls managed by the WIO system can be divided into internal calls and external calls. Internal calls for those calls where both parties involved in the call are located within the WIO system and external calls involve a user who is not located within the WIO system.

15 Reference will now be made to Figure 2 which illustrates an embodiment of the present invention. The office environment 100 illustrated in Figure 1 may be more complex and be as shown in Figure 2. The office environment may therefore be divided into two segments or domains. The operator segment 40 is administered by the network operator and can include the mobile communication functions.

20 In the embodiment shown in Figure 2, the operator segment 40 has two base stations 42 and 44. Each of these base stations 42 and 44 has its own cell and is able to communicate with the mobile station 46 when the mobile station 46 is in the cell associated with the respective base transceiver station 42 or 44. In practice, more than one mobile station will be present in the operator segment 40. Each of the base transceiver stations 42 and 44 is connected to a respective GSM radio gateway 48 and 50 respectively. The connection between the base transceiver station 42 or 44 and its associated GSM radio gateway 48 or 50 may be via a wired or a wireless connection. Each of the GSM radio gateways 48 and 50 are connected to a LAN 52.

35 Also connected to the LAN 52 is a gatekeeper 54. The base transceiver stations 42 and 44, GSM radio gateway 48 and 50 and the gatekeeper 54 all provide the same function as those components described in relation to Figure 1.

40 The office segment 42 comprises first and second H.323 terminals 56 and 58 respectively. Both of the H.323 terminals can take any

5 suitable form and may, for example, be computer terminals with
voice-over-IP capabilities. The H.323 terminals 56 and 58 are
connected to a second LAN 60. The second H.323 terminal 58 is
coupled to a private branch exchange 62 which may, as in the
10 arrangement shown in Figure 2, be connected to an external public
service telephone network. In the embodiment shown in Figure 2,
either or both of the LANs 52 and 60 will be connected to an
external internet.

15 The embodiment shown in Figure 2 is arranged to deal with two
problems. Firstly, the embodiment shown in Figure 2 seeks to
provide a secure connection between the two segments to avoid
undesired access from one segment to another. Secondly, the
terminals 56 and 58 in the office segment shown in Figure 2 are
20 fixed terminals whilst the terminals in the operator segment 40
are mobile stations 46. In particular, the embodiment shown in
Figure 2 aims to deal with the situation which occurs when the
mobile station 46 moves from the cell associated with one base
transceiver station 42 to the cell of the base transceiver
station 44 which is associated with a different intranet mobile
25 cluster interface 50.

Both of these aims are dealt with by the provision of a MMGW
mobility and media gateway and firewall arrangement 64. This is
shown in more detail in Figure 3.

30 Embodiments of the present invention use the IP protocol which
works on the basis of addresses and port information which
together define a destination.

35 A "packet filter" type firewall looks at from who (port
information) and from where (address information) a packet is
sent as well as to whom and where the packet is sent. In other
words, it looks for four pieces of information in each data
packet; source address, source port, destination address and
40 destination port. Only packets associated with previously defined
source and destination addresses and port information are allowed

5 through the firewall.

Application-level proxy firewalls are one which are aware of the application. In this case, this would mean that a firewall knows about WIO and how WIO works. The necessary information is
10 inferred directly from the call set up signalling. Application proxy firewalls read, interpret and modify the content of signalling messages.

Firewalls are effectively invisible to other network elements.
15 Packets pass through the firewalls, but they are never addressed to a firewall. In other words, firewalls observe traffic that is passing between other network elements and lets some packets pass whilst removing others. Either of these two firewalls as well as any other suitable firewall can be used in embodiments of the
20 present invention.

In the present embodiment, packets are explicitly addressed to the media and mobility gateway. The media and mobility gateway will receive the packets, check them, convert the address
25 information and retransmit the packets.

For the media and mobility gateway to operate properly, packets must be addressed to it. As the network has two segments, this means that the mobility and media gateway may have a dual entity.
30 It may have one address that is visible to the first segment and another that is visible to the second segment. These addresses may be the same.

Figure 3 shows various different ways in which the firewall and
35 mobility and media gateway arrangement can be implemented in practice.

Figure 3a shows the second segment 42 being protected by using a firewall 80 and a single mobility and media gateway 82 in the
40 second segment. In this case, the media and mobility gateway 82 is part of the second segment and has a single identity. The

5 firewall 80, which is also part of the second segment is configured to pass traffic to and receive traffic from the mobility and media gateway 82. It should be appreciated that the data to be sent to the first segment 40 from the second segment 42 must pass through the firewall 80 first.

10 Figure 3b shows a second arrangement. In this arrangement, the firewall 80 and the mobility and media gateway 82 of the first arrangement are provided. Additionally, a second firewall 84 is provided in the first segment 40. Both firewalls 80 and 84 are
15 configured to pass data to and receive data from the mobile and media gateway 82.

A third arrangement is shown in Figure 3c. A firewall 84 is provided in the first segment 40 whilst the mobility and media gateway 82 is provided in the second segment 42. There is no firewall in the second segment 42. The firewall 84 is again configured to pass all data to and from the mobility and media gateway 52.

20 In the fourth arrangement, no firewall is used. The mobility and media gateway 82 is only provided in the second segment 42. The fifth arrangement shown in Figure 3e is similar to that shown in Figure 3d. However, the mobility and media gateway 82 is instead only provided in the first segment 40.

25 In the sixth arrangement, which is used in preferred embodiments of the present invention, the mobility and media gateway 82 is effectively provided in each of the segments 40 and 42. It will therefore have a dual identity, one for each segment. Since the
30 mobility and media gateway 82 has a dual identity, it belongs to both of the segments and hence no intersegment traffic occurs. Rather, the mobility and media gateway 82 tunnels the data between the segments. The use of a firewall can be dispensed with. The mobility and media gateway 82 can be configured in any
35 suitable manner so that the mobility and media gateway 82 is trusted entity by both segments 40 and 42. In other words, the
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5 function of the firewalls can be provided by the mobility and media gateway 82.

10 The call set up procedure will now be described. It is assumed that one of the H.323 terminals 56 and 58 is calling a mobile station 46 in the first segment 40. It is assumed that the sixth arrangement shown in Figure 3f is present. The mobility and media gateway 82 has a dual identity where address 1 is the mobility media gateway identity in the first segment and address 2 is the identity of the mobility media gateway 82 in the second segment 42. The H.323 terminal 56 sends the call set up message to the gatekeeper 54. If there are firewalls present, they can be configured to pass this message through, as the gatekeeper's port number for call signalling is well known to the firewall.

20 The gatekeeper 54 receives a set up message and notes that the requested destination is a mobile station 46 and that it therefore needs to be polled. The gatekeeper 54 then commences a paging procedure. Whilst paging is carried out, the gatekeeper 54 requests that the mobility and media gateway 82 reserve a port number. The mobility and media gateway 82 selects a port number and replies to the gatekeeper 54. The paging ends with the GSM radio gateway 48 currently serving the mobile station 46 sending a paging response message. The gatekeeper 54 knows the gateway address that serves the mobile station 46 from this message. The gatekeeper 54 will thus know where to send the call set up information. It will include in the call set up information the port and address information of the mobility and media gateway 82 which has been reserved. This is in order to instruct the GSM radio gateway 48 to direct the call data flow correctly.

35 The GSM radio gateway 48 receives the call set up message and will reserve a port number for this call. The GSM radio gateway 48 confirms the call by sending a message to the gatekeeper 54 detailing the port number it has selected.

40 The gatekeeper 54 now needs to create an association with the

5 mobility and media gateway 82. One port has been already reserved
which is intended to receive data from the mobile station sent
by the GSM radio gateway 48. It also needs to tell the mobility
and media gateway 82 where the mobility and media gateway is to
10 send data which has been received from the H.323 terminal 56.
Finally, the gatekeeper 54 also needs to provide an indication
for the mobility and media gateway 82 to realise that the
information is related to a single call. In other words, an
association is created between the call, the information and
15 resources (source and destination addresses and port numbers)
reserved for the call. It therefore sends a configuration message
to the media and mobility gateway that includes:

- a) source and destination addresses and ports in order to
associate them together and in order to advise the mobility
and media gateway 82 about the destination information; and
- 20 b) the already reserved port information so that the mobility
and media gateway 82 can relate this new information with
the previously allocated resources.

25 The mobility and media gateway 82 creates the association by
storing the information in its register. It will now select a
free port on the H.323 terminal side.

30 The mobility and media gateway 82 responds to the gatekeeper 54
with the newly allocated port number. The gatekeeper sends a call
confirmation message towards the H.323 terminal including the
mobility and media gateway address and port number in that
segment. This is in order to tell the H.323 terminal where to
35 send the data.

40 The call can now be commenced. The processing of the speech
packets will now be described. The H.323 terminal 56 has speech
data which it wishes to send to the mobile station 46. It sends
the speech data to the mobility and media gateway address and
port it is received as part of the call set up procedure. As the
mobility and media gateway receives the data, it will check that

5 the source address and port match the port where the data was received. If so, the mobility and media gateway 82 will forward the data towards the GSM radio gateway 48 that serves the mobile station, using the data it receives during call set up.

10 The GSM radio gateway 48 in turn has some data which it wishes to send to the H.323 terminal from the mobile station. It will transmit the data to the mobility and media gateway 82 using the identity of the mobility and media gateway that is visible to it. The mobility and media gateway will again check the information.
15 If the data on the receiving port matches the expected sender, it will forward the data to the H.323 terminal. Otherwise, the data will be discarded.

20 If the mobile station moves from the cell associated with one of the base stations 42 to the cell associated with another of the base stations 44, handoff will be required. The GSM radio gateway 48 currently serving the mobile station will decide when handoff is required. It will then inform the gatekeeper 54. The gatekeeper 54 sends a handoff request to the new GSM radio gateway 50. The target GSM radio gateway selects the port that
25 it will use to receive the speech data. This information is forwarded to the gatekeeper, handoff is then executed. Once an indication of successful handoff is received, the existing association in the mobility and media gateway 82 is updated with
30 the new information.

The mobility and media gateway may process call signalling particularly if it is configured as shown in Figure 3f. Consider the following situation.

35 A H.323 terminal 56 must use the RAS (registration, admission and status) signalling prior to sending a call setup request in order to get admission from the gatekeeper 54 to use the network. With the admission request, the H.323 terminal 56 sends its own port
40 number where it wishes to receive the signalling messages. The message is sent towards the well known port of the mobility and

5 media gateway 82, which will relay the message to the gatekeeper 54.

10 The mobility and media gateway 82 receives the message at its well known port. It will read and store the port information of the H.323 terminal 56 and replace the information with its own data, and forward the data towards the gatekeeper 54. The gatekeeper 54 receives the message, and selects a port, and replies to the message.

15 The mobility and media gateway 82 will again store the gatekeeper's port number, allocate a new port number for the H.323 terminal and send the message forward. Having received a admission configuration from the gatekeeper 54, the H.323 terminal 56 now sends the call setup request.

20 Eventually the call setup request reaches the GSM radio gateway 48 which will also make a request for admission prior to accepting the call set-up request. This time, the mobility and media gateway 82 is not involved and the allocation of ports is more straightforward.

25 Another way of carrying out this function would be to bundle these transactions into the call setup messages.

30 If a firewall is included such as shown in Figures 3a to 3c, and the mobility and media gateway 68 does process signalling as well, then the allocation of speech ports can be modified to be more straightforward. This is described hereinafter.

35 The H.323 terminal 56 sends the call setup request towards the mobility and media gateway 82, which "acts" like the gatekeeper 54.

40 The mobility and media gateway 82 will read the port information and replace it with it's own information. The read data is stored in the register in the mobility and media gateway 82. The

5 mobility and media gateway 82 forwards the data towards the gatekeeper 54.

10 The gatekeeper does the normal polling (or paging) to find the mobile station 46. Once the mobile station 46 has been found, the gatekeeper 54 forwards the setup message towards the GSM radio gateway 48.

15 When the call is confirmed, the GSM radio gateway 48 sends the message through the gatekeeper 54 to the mobility and media gateway 82. The gatekeeper 54 uses the mobility and media gateway port information it received in the setup message when forwarding the message to the mobility and media gateway 82.

20 The mobility and media gateway will read the GSM radio gateway port information from the confirmation message and storage it in its register. The mobility and media gateway 82 will allocate a new port information for the speech stream that is coming from the H.323 terminal 56. Then the mobility and media gateway 82 replaces the port information and forwards the confirmation message towards the H.323 terminal 56.

25 When the terminal receives the confirmation message, it will learn the port number where it will send the data as described hereinbefore.

30 The mobility and media gateway can carry out other functions. For example, as part of the call setup, the end points may specify how much bandwidth is going to be used for the transactions. The security of the mobility and media gateway can be enhanced by
35 adding functionality that monitors the actual bandwidth used by the end points during the call. If it is significantly different from what was specified, the mobility and media gateway may close the call. In other words, the mobility and media gateway can use other data which it learns as part of the call setup procedure
40 to assist in maintaining a secure system.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
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